CLAIMS

1. Wavelength converter device (100), for generating a converted radiation at frequency ω_g through interaction between at least one signal radiation at frequency ω_s and at least one pump radiation at frequency ω_p, comprising

* an input (1) for said at least one signal radiation at frequency ω_s;
* a pump light source (3) for generating said at least one pump radiation at frequency ω_p;
* an output (2) for taking out said converted radiation at frequency ω_g;
* a structure (4) for transmitting said signal and pump radiation, said structure (4) including one optical resonator (10) comprising a non-linear material, having an optical length of at least $40*\lambda/2$, wherein λ is the wavelength of the pump radiation, and resonating at the pump, signal and converted frequencies ω_p, ω_s and ω_g,

characterized in that said structure (4) comprises a further optical resonator (20) coupled in series to said optical resonator (10), said further optical resonator (20) comprising a non-linear material, having an optical length of at least $40*\lambda/2$, wherein λ is the wavelength of the pump radiation, and resonating at the pump, signal and converted frequencies ω_p, ω_s and ω_g; wherein by propagating through said structure (4) the pump and signal radiation generate said converted radiation by non-linear interaction within said optical resonators (10, 20).

2. Wavelength converter device (100) according to claim 1, wherein the converted radiation is generated by four-wave-mixing.

3. Wavelength converter device (100) according to claim 1 or 2, wherein the optical resonator (10) and the further optical resonator (20) each have an optical length lower than or equal to $7500*\lambda/2$.

4. Wavelength converter device (100) according to any of

claims 1 to 3, wherein the optical resonator (10) and the further optical resonator (20) comprise reflectors each having a power reflectivity of at least 0.5.

5. Wavelength converter device (100) according to any of claims 1 to 4, wherein the optical resonator (10) is a Fabry-Perot like cavity bounded by two partially reflecting mirrors.

6. Wavelength converter device (100) according to claim 5, wherein the further optical resonator (20) is a Fabry-Perot like cavity bounded by two partially reflecting mirrors.

7. Wavelength converter device (100) according to any of claims 1 to 4, wherein the optical resonator (10) is a microring like resonator.

8. Wavelength converter device (100) according to claim 7, wherein the further optical resonator (20) is a microring like resonator.

9. Wavelength converter device (100) according to any of claims 1 to 4, wherein the optical resonator (10) is formed in a photonic crystal waveguide.

10. Wavelength converter device (100) according to claim 9, wherein the further optical resonator (20) is formed in a photonic crystal waveguide.

11. Wavelength converter device (100) according to any of claims 1 to 10, comprising a further structure (4) in series to the structure (4).

12. Wavelength converter device (100) according to claim 11, further comprising a phase mismatch compensating element (5) adapted to compensate for the phase mismatch accumulated by the pump and signal radiation along the structure (4).

13. Wavelength converter device (100) according to claim 12, wherein the phase mismatch compensating element (5) is

placed between the structure (4) and the further structure (4).

14. Wavelength converter device (100) according to claim 12 or 13, wherein the phase mismatch compensating element (5) comprises a material having a non-linear refractive index n2 lower than the non-linear refractive index of the material included in the structure (4) and the further structure (4).

15. Use of a structure (4) comprising a plurality of cascaded optical resonators (10, 20) for generating a radiation at frequency ω_g through non-linear interaction of at least one pump radiation at frequency ω_p with at least one signal radiation at frequency ω_s, wherein said resonators (10, 20) comprise a non-linear material, resonate at the pump, signal and converted frequencies ω_p, ω_s and ω_g, and have an optical length of at least $40*\lambda/2$, wherein λ is the wavelength of the pump radiation.

16. Use of a structure (4) according to claim 15, wherein the radiation at frequency ω_g is generated by four-wave mixing.

17. An apparatus (26) for an optical network node comprising

– a routing element (39) with at least one input port (32) and a plurality of output ports (33) for interconnecting each input port with at least one corresponding output port;

– at least one wavelength converter device (100), according to any of claims 1 to 14, optically coupled to one of the ports (32, 33) of said routing element (39).

18. An optical communication line (23) comprising an optical transmission path (25), for transmitting at least one signal radiation at frequency ω_s, and a wavelength converter device (100) according to any of claims 1 to 14,

wherein said wavelength converter device (100) is optically coupled to said optical transmission path (25) for generating a radiation at frequency ω_g by non-linear interaction between at least one pump radiation at frequency ω_p and said at least one signal radiation at frequency ω_s.

19. An optical communication line (23) according to claim 18, wherein the optical transmission path (25) is an optical fiber length.

20. Use of a structure (4), comprising a plurality of cascaded optical resonators (10, 20) comprising a non-linear material, for altering the optical spectrum of at least one signal radiation at frequency ω_s propagating through it by non-linear interaction of the optical signal radiation within the material of the optical resonators (10, 20), wherein said optical resonators (10, 20) resonate at the signal radiation frequency ω_s and have an optical length of at least $40*\lambda/2$, wherein λ is the wavelength of the signal radiation.